

### **REMARKS**

This Amendment is presented in response to the Office Action. By this paper, claims 4, 8, 10-13, 17, 19-20 and 30 are cancelled, claims 1, 21, 24, 28-30, 32 and 33 are amended, and new claim 34 is added. Claims 1-3, 5-7, 9, 14-16, 18, 21-29 and 31-34 are now pending in this application.

Reconsideration of this application is respectfully requested in view of the aforementioned amendments to the claims and the following remarks. For the convenience and reference of the Examiner, the remarks of the Applicant are presented in the order in which the corresponding issues were raised in the Office Action.

#### **I. General Considerations**

Applicant notes that the amendments and remarks presented herein have been made merely to clarify the claimed embodiments from elements purported by the Examiner to be taught by the cited references. Such amendments and remarks should not be construed as an acquiescence, on the part of the Applicant, as to the purported teachings or prior art status of the cited references, nor as to the characterization of the cited references advanced by the Examiner. Accordingly, Applicant reserves the right to challenge the purported teaching and prior art status of the cited references at any appropriate time.

#### **II. Objection to Claim 8**

The Examiner has objected to claim 8 under 37 CFR 1.75 stating that "it is not clear that claim 8 is depended on." Applicant submits that in view of the cancellation herein of claim 8, the objection has been overcome and should be withdrawn.

#### **III. Alleged Double Patenting**

The Examiner has objected to claims 4 and 19-20 as being substantial duplicates of, respectively, claims 3, 5 and 9. Applicant submits that in view of the cancellation of claims 4, 19 and 20 herein, the objection has been overcome and should be withdrawn.

#### **IV. Claim Rejections under 35 U.S.C. § 102(e)**

##### **a. general considerations**

Applicant respectfully notes at the outset that a claim is anticipated under 35 U.S.C. § 102(a), (b), or (e) only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Further, the identical invention must be shown in as complete detail as is contained in the claim. Finally, the elements must be arranged as required by the claim. See Manual of Patent Examining Procedure ("M.P.E.P.") § 2131.

**b. rejection of claims 1, 5-7, 14 and 19**

The Examiner has rejected claims 1, 5-7, 14 and 19 under 35 U.S.C. § 102(e) as being anticipated by US 6,359,920 to Jewell et al. ("*Jewell*"). In light of the cancellation herein of claim 19, Applicant submits that the rejection of that claim has thus been rendered moot and should be withdrawn. As to remaining claims 1, 5-7 and 14, Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

While Applicant disagrees that *Jewell* anticipates claims 1, 5-7, 14 and 19, Applicant has amended claim 1 to recite barrier layers that include nitrogen. As discussed in further detail below in connection with claim 2, the Examiner has not established that *Jewell* or any other reference anticipates or renders obvious the combination now recited in amended claim 1.

For at least the foregoing reasons, Applicant respectfully submits that *Jewell* fails to anticipate amended claim 1 and the rejection of claim 1, as well as the rejection of claims 5-7 and 14, should accordingly be withdrawn.

**V. Claim Rejections under 35 U.S.C. § 103(a)**

**a. general considerations**

Applicant respectfully notes at the outset that in order to establish a *prima facie* case of obviousness, it is the burden of the Examiner to demonstrate that three criteria are met: first, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; second, there must be a reasonable expectation of success; and third, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See M.P.E.P. § 2143.

**b. rejection of claims 2, 8 and 15**

The Examiner has rejected claims 2, 8 and 15 under 35 U.S.C. § 103(a) as being unpatentable over *Jewell* in view of the abstract of WO 01/52373 A2 to Riechert ("*Riechert*"). In light of the

cancellation herein of claim 8, Applicant submits that the rejection of that claim has thus been rendered moot and should be withdrawn. As to remaining claims 2 and 15, Applicant respectfully disagrees with the Examiner and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

In posing the rejection of claims 2 and 15, the Examiner has referred to the *Riechert* abstract, asserting that “for the benefit of producing a long and reliable wavelength VCSEL with stable performance, it would have been obvious to . . . provide Jewell the GaAsN barrier layers as taught by Reichert.” However, a review of the *Riechert* abstract reveals that the abstract is concerned with an arrangement where an “active layer (1)” is positioned between a pair of “barrier layers (2)” (see Abstract figure of *Riechert*). Thus, the *Riechert* abstract distinguishes between an “active layer (1)” on the one hand, and a “barrier layer (2)” on the other hand. In contrast, claim 2 is directed to an arrangement where the active region includes barrier layers. Particularly, claim 2 recites “an active region comprising . . . barrier layers sandwiching said at least one quantum well” (emphasis added). However, the Examiner has not established that the *Riechert* abstract teaches or suggests such an active region.

In view of the foregoing, it is clear that even if the teachings of *Riechert* were combined with those of *Jewell*, as the Examiner has suggested would be obvious to do, the resulting combination nonetheless fails to include all the limitations of claim 2.

Moreover, while the Examiner has suggested it would be obvious to combine the disclosure of the *Riechert* abstract with the teachings of *Jewell*, it is not at all clear that there is any motive to make such a combination. For example, the Examiner asserts that the combination would be obvious for the purported benefit of producing a “long and reliable wavelength VCSEL with stable performance.” However, *Jewell* asserts that it is directed to long wavelength VCSELs - the title of the *Jewell* patent is “EXTENDED WAVELENGTH STRAINED LAYER LASERS HAVING STRAIN COMPENSATED LASERS” (emphasis added). Additionally, *Jewell* asserts in the “Summary of the Invention” that “These techniques, applied to newly-identified parameter spaces, allow the unexpected result of pseudo-morphic structures grown on GaAs substrates which emit at 1.3 $\mu$ m and longer wavelengths” (col. 6, lines 41-44). Given these recitations from *Jewell*, it is not evident that one of skill in the art would be motivated to modify the *Jewell* device in the manner suggested by the Examiner.

Moreover, the Examiner has not established that the *Jewell* device lacks reliability and/or stability to the extent that it would be obvious to include the *Riechert* barrier layer in that device. Even assuming,

strictly for the sake of argument, that the *Jewell* device did lack such reliability and/or stability, the Examiner has not established that inclusion of the *Riechert* barrier layer in the *Jewell* device would be an adequate remedy.

Applicant respectfully submits that in view of the foregoing discussion, the Examiner has failed to establish that one of skill in the art would be motivated to modify the *Jewell* device to include the *Riechert* barrier layer. Applicant thus further submits that the rejection of claims 2 and 15 has been overcome and should be withdrawn.

Finally, Applicant notes that the foregoing discussion of claims 2 and 15 is germane as well to amended claim 1 (which now recites barrier layers that include nitrogen), insofar as the Examiner has characterized the *Riechert* abstract as teaching a barrier layer comprising InGaAsN or GaAsN.

**c. rejection of claims 3-4, 9-13, 16-18 and 20**

The Examiner has rejected claims 3-4, 9-13, 16-18 and 20 under 35 U.S.C. § 103(a) as being unpatentable over *Jewell* in view of US 6,002,705 to Thornton ("*Thornton*"). In light of the cancellation herein of claims 4, 10-13 and 20, Applicant submits that the rejection of those claims has thus been rendered moot and should be withdrawn. As to remaining claims 3, 9 and 16-18, Applicant respectfully disagrees with the Examiner and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

By virtue of their dependence from claim 1, claims 3, 9 and 16-18 each are directed to a VCSEL having an active region comprising barrier layers that include nitrogen. Particularly, those claims require, among other things, "an active region comprising . . . barrier layers sandwiching said at least one quantum well, the barrier layers including nitrogen." However, the Examiner has not established that *Thornton* or *Jewell* teaches or suggests the aforementioned limitation. Thus, even if the teachings of *Thornton* were combined with those of *Jewell* in the manner suggested by the Examiner, it is nonetheless clear that the resulting combination fails to include all the limitations of claims 3, 9 and 16-18.

For at least the foregoing reasons, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 3, 9 and 16-18. Applicant thus further submits that the rejection of those claims has been overcome and should be withdrawn.

**d. rejection of claims 21-25 and 27-28**

The Examiner has rejected claims 21-25 and 27-28 under 35 U.S.C. § 103(a) as being unpatentable over *Jewell* in view of *Thornton*. Applicant respectfully disagrees with the Examiner

however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

With respect first to claims 21-22, 25 and 28, the Examiner has conceded that “Jewell lack AlGaAs barrier layers sandwiching the at least one quantum well and AlGaAs confinement layers sandwiching the active region.” The Examiner then goes on to assert that “Thornton teaches AlGaAs barrier layers (col. 4, 1.62-63) sandwiching the at least one quantum well . . .” Finally, the Examiner concludes that “For the benefit of producing a long and reliable wavelength VCSEL with stable performance, it would have been obvious to . . . provide Jewell AlGaAs barrier layers sandwiching the at least one quantum well . . . as taught by Thornton.”

Notwithstanding the foregoing, Applicant respectfully submits that *Thornton* does not teach “AlGaAs barrier layers (col. 4, 1.62-63) sandwiching the at least one quantum well . . .” Instead, *Thornton* states “The quantum wells are typically formed by pairs of GaAs well layers and AlGaAs barrier layers (neither shown) . . .” (col. 4, lines 62-63) (emphasis added). It would thus appear from the portion of *Thornton* cited by the Examiner that *Thornton* is concerned with quantum wells that include AlGaAs barrier layers and not with quantum wells that are sandwiched by AlGaAs barrier layers as required by claims 21-22, 25 and 28. Thus, even if the teachings of *Thornton* and *Jewell* are combined, the resulting combination fails to include all the limitations of claims 21-22, 25 and 28.

Moreover, the Examiner has not established that the *Jewell* device lacks reliability and/or stability to the extent that it would be obvious to modify the *Jewell* device to include components disclosed in *Thornton*. Even assuming, strictly for the sake of argument, that the *Jewell* device did lack such reliability and/or stability, the Examiner has also failed to establish that inclusion of components from *Thornton* in the *Jewell* device would be an adequate remedy.

Finally, Applicant respectfully submits that it is not at all clear that modification of the *Jewell* device with components disclosed in *Thornton* would produce, as the Examiner has asserted, “a long and reliable wavelength VCSEL.” Particularly, while *Jewell* purports to be concerned with devices “which emit at 1.3 $\mu$ m and longer wavelengths” (col. 6, lines 41-44), *Thornton* notes that “A typical desired output wavelength range is 760 to 830 nanometers” (col. 4, lines 48-49). It would thus appear that the *Thornton* devices are intended to operate at much shorter wavelengths than the *Jewell* devices. Consequently, it is not clear that modification of the *Jewell* device with components disclosed in *Thornton* would necessarily produce the “benefit” that the Examiner has asserted would result from such a combination. In light of

this, Applicant respectfully submits that the Examiner has failed to establish any motivation to modify the *Jewell* device in the manner the Examiner has claimed would be obvious to do.

For at least the foregoing reasons, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 21-22, 25 and 28. Applicant thus further submits that the rejection of claims 21-22, 25 and 28 has been overcome and should be withdrawn.

Turning now to claim 24, it was noted above that the Examiner has rejected claim 24 as being unpatentable over *Jewell* in view of *Thornton*, conceding that “*Jewell* lack . . . AlGaAs confinement layers sandwiching the active region” and then concluding “For the benefit of producing a long and reliable wavelength VCSEL with stable performance, it would have been obvious to . . . provide *Jewell* . . . AlGaAs confinement layers sandwiching the active region as taught by *Thornton*.” As discussed above in connection with claims 21-22, 25 and 28 however, the Examiner has failed to establish that the *Jewell* device lacks reliability and/or stability to the extent that it would be obvious to modify the *Jewell* device to include components disclosed in *Thornton*. Even assuming, strictly for the sake of argument, that the *Jewell* device did lack such reliability and/or stability, the Examiner has also failed to establish that inclusion of components from *Thornton* in the *Jewell* device would be an adequate remedy.

Further, it was also noted above that the Examiner has not established that modification of the *Jewell* device with components disclosed in *Thornton* would necessarily produce the “benefit” that the Examiner has asserted would result from such a combination. In light of this, Applicant respectfully submits that the Examiner has failed to establish any motivation to modify the *Jewell* device in the manner the Examiner has claimed would be obvious to do.

For at least the foregoing reasons, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 24. Applicant thus further submits that the rejection of claim 24 has been overcome and should be withdrawn.

Regarding claims 23 and 27, the Examiner has rejected those claims as being unpatentable over *Jewell* in view of *Thornton*, stating that “*Jewell* disclose the quantum well thickness is less than 80A that satisfies the claim limitation of 50A.” Applicant respectfully notes at the outset that the Examiner has failed to identify, with any particularity, where the aforementioned limitation is purportedly disclosed in *Jewell*.

Additionally, the attention of the Examiner is directed to the discussion of claims 21 (from which claim 23 depends) and 24 (from which claim 27 depends) which is germane also to the rejection of claims

23 and 27. Particularly, claim 23, by virtue of its dependency from claim 21, requires "AlGaAs barrier layers sandwiching said at least one quantum well." As noted in connection with the discussion of claim 21 however, *Thornton* fails to teach, at least, this limitation. Thus, regardless of any teaching regarding quantum well thickness in *Jewell*, the combined teachings of *Jewell* and *Thornton* fail to include all the limitations of claim 23. It was also noted in connection with claim 21 that the Examiner has failed to establish any motive to modify the *Jewell* device with the teachings of *Thornton*.

Further, claim 27 requires, by virtue of its dependence from claim 24, "AlGaAs confinement layers sandwiching said active region." As discussed above in connection with claim 24 however, the Examiner has failed to establish that it would be obvious to modify the *Jewell* device to include the "upper AlGaAs confinement layer 122" and the "lower AlGaAs confinement layer 118" recited in *Thornton*. Thus, regardless of any teaching regarding quantum well thickness in *Jewell*, the Examiner has failed to establish any motive to combine the teachings of those references.

For at least the foregoing reasons, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claims 21-25 and 27-28. Applicant thus further submits that the rejection of those claims has been overcome and should be withdrawn.

**e. rejection of claim 26**

The Examiner has rejected claim 26 under 35 U.S.C. § 103(a) as being unpatentable over *Jewell* in view of *Thornton* and further in view of *Riechert*. Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

Particularly, the Examiner has asserted that "Jewell and Thornton disclose all limitations of the claim except for the InGaAsN barrier layers. Riechert teach the InGaAsN barrier layers (see Abstract). For the benefit of producing a long and reliable wavelength VCSEL with stable performance, it would have been obvious to . . . provide Jewell and Thornton the InGaAsN barrier layers as taught by Riechert."

As noted above in connection with the discussion of claim 2, the *Riechert* abstract distinguishes between an "active layer (1)" on the one hand, and a "barrier layer (2)" on the other hand. In contrast, claim 26 is directed to an arrangement where the active region includes barrier layers. Particularly, claim 26 is directed to an arrangement having "an active region comprising . . . barrier layers sandwiching said at least one quantum well" (emphasis added). It was noted earlier herein however that the Examiner has not established that the *Riechert* abstract teaches or suggests such an active region. Thus, even if the

teachings of *Riechert* were combined with those of *Jewell* and *Thornton*, as the Examiner has suggested would be obvious to do, the resulting combination nonetheless fails to include all the limitations of claim 26.

Moreover, the Examiner has not established that the *Jewell* device lacks reliability and/or stability to the extent that it would be obvious to include the *Riechert* barrier layer in that device. Even assuming, strictly for the sake of argument, that the *Jewell* device did lack such reliability and/or stability, the Examiner has not established that inclusion of the *Riechert* barrier layer in the *Jewell* device would be an adequate remedy.

For at least the foregoing reasons, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 26. Applicant thus further submits that the rejection of those claims has been overcome and should be withdrawn.

**f. rejection of claim 29**

The Examiner has rejected claim 29 under 35 U.S.C. § 103(a) as being unpatentable over *Jewell* in view of *Thornton*. Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

With regard to claim 29, the Examiner has conceded that “*Jewell* lack the AlGaAs confinement layers,” but asserts that “*Thornton* teach AlGaAs confinement layers sandwiching the active region (col. 5, 1.1-3)” and then concludes that “For the benefit of producing a long and reliable wavelength VCSEL with stable performance, it would have been obvious to . . . provide *Jewell* AlGaAs confinement layers sandwiching the active region as taught by *Thornton*.”

Applicant notes that claim 24, similar to claim 29, recites “AlGaAs confinement layers sandwiching said active region.” Accordingly, the discussion of claim 24 is germane to claim 29 also and the attention of the Examiner is respectfully directed to such discussion. For at least the reasons outlined in the aforementioned discussion, Applicant submits that the rejection of claim 29 has likewise been overcome and should be withdrawn.

**g. rejection of claim 30**

The Examiner has rejected claim 30 under 35 U.S.C. § 103(a) as being unpatentable over *Riechert* in view of US 6,621,842 to Dapkus (“*Dapkus*”). Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.



In the rejection of claim 30, the Examiner has asserted that "Riechert disclose a VCSEL comprising an active region further comprising at least one quantum well comprised of InGaAsN (Abstract) and including GaAsN barrier layers sandwiching the at least one quantum well." In this regard, the attention of the Examiner is respectfully directed to the discussion of claim 2, above, where it was noted that the *Riechert* abstract reveals that the abstract is concerned with an arrangement where an "active layer (1)" is positioned between a pair of "barrier layers (2)." Thus, the *Riechert* abstract distinguishes between an "active layer (1)" on the one hand, and a "barrier layer (2)" on the other hand. In contrast, claim 30 is directed to an arrangement where the active layer includes barrier layers. Particularly, claim 30 is directed to an arrangement having "an active region comprising . . . barrier layers sandwiching said at least one quantum well" (emphasis added).

Because the Examiner has not established that the *Riechert* abstract, or *Dapkus*, teaches or suggests such an active region, the allegedly obvious combination of *Riechert* and *Dapkus* fails to include all the limitations of claim 30. For at least this reason, Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 30 and the rejection of claim 30 should accordingly be withdrawn.

**h. rejection of claim 32**

The Examiner has rejected claim 32 under 35 U.S.C. § 103(a) as being unpatentable over *Riechert* in view of *Thornton*. Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

Claim 32, similar to claim 30, is directed to an arrangement having "an active region comprising . . . barrier layers sandwiching said at least one quantum well" (emphasis added). Accordingly, the discussion of claim 30 above is germane to claim 32 as well and Applicant respectfully directs the attention of the Examiner to such discussion. For at least the reasons outlined in the aforementioned discussion of claim 30, Applicant submits that the rejection of claim 32 has likewise been overcome and should be withdrawn.

**i. rejection of claim 33**

The Examiner has rejected claim 33 under 35 U.S.C. § 103(a) as being unpatentable over *Riechert* in view of *Thornton*. Applicant respectfully disagrees with the Examiner however and submits that for at least the reasons outlined below, the aforementioned rejection should be withdrawn.

In particular, the Examiner has asserted that “For the benefit of producing a *proper* active region of a VCSEL, it would have been obvious to . . . provide Jewell AlGaAs confinement layers sandwiching the active region as taught by Thornton” (emphasis). Applicant respectfully submits that this assertion by the Examiner is a wholly inadequate, and improper, basis upon which to base an assertion of the obviousness of claim 32.

For example, Applicant is unclear as to what the Examiner means when referring to a “proper” active region. It would seem, by implication at least, that the Examiner believes that the active region(s) disclosed in *Jewell* are “improper” in some way, but the Examiner does not elaborate on that point. To the extent the Examiner has not specifically identified problems or inadequacies in the *Jewell* device, such as could be overcome by the AlGaAs confinement layers purportedly disclosed in *Thornton*, the Examiner has failed to establish any motive to modify the *Jewell* device.

Further, because the Examiner has failed to identify any statement or suggestion in the references that the *Jewell* active region is “improper,” whatever that term may mean, it appears that the rejection of claim 33 is inappropriately based on the assessment of Examiner that the *Jewell* active region suffers from some, unidentified, deficiency. However, Applicant submits that it is improper for a rejection to be based upon an assessment by the Examiner that there is some shortcoming in the reference. Instead, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. See M.P.E.P. § 2143.

For at least the reasons outlined above, Applicant submits that the Examiner has failed to establish a *prima facie* case of obviousness with respect to claim 33, and the rejection of the claim should accordingly be withdrawn.

#### **VI. New claim 34**

Applicant has added new claim 34 herein which requires, among other things, “a flattening layer interposed between the lower confinement layer and the at least one quantum well.” Support for new claim 34 can be found, for example, at Figure 13 of the application.

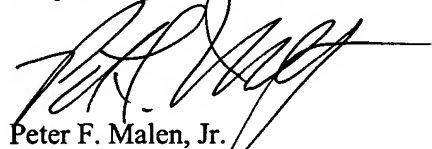
It does not appear that the cited references teach or suggest the combination recited in new claim 34. Accordingly, Applicant respectfully submits that claim 34 is in condition for allowance.

**CONCLUSION**

In view of the remarks submitted herein, Applicant respectfully submits that each of the pending claims 1-3, 5-7, 9, 14-16, 18, 21-29 and 31-34 is now in condition for allowance. Therefore, reconsideration of the rejections is requested and allowance of those claims is respectfully solicited. In the event that the Examiner finds any remaining impediment to a prompt allowance of this application that could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

Dated this 27<sup>th</sup> day of April, 2005.

Respectfully submitted,



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